DRIVING INNOVATION WITH ANSYS AND HPE HIGH-PERFORMANCE COMPUTING SOLUTIONS

Ansys

The new age of manufacturing

Manufacturers face major challenges to diversify and improve their products and services. As customers demand higher quality and faster turnaround times, manufacturers need to optimize design and development to achieve new levels of engineering productivity.

Whether it's measuring the velocity of air through a jet engine, the transfer of heat between components on a circuit board, gauging the power efficiency of an electronic device, or any of millions of complex product design scenarios, the ability of engineers to build better products, innovate faster, and make our world safer depends on knowing how product designs will perform in the real world. Increasing the integrity of products and services is crucial to gaining competitive advantage. To accomplish these goals, manufacturers rely on high-performance computing (HPC) solutions from HPE and AMD to scale applications from Ansys.

Computer-aided engineering (CAE) has become critical in bringing new products to market. Advancements in CAE have transformed manufacturing with a cutting-edge approach to modeling and simulation. CAE reduces the need to build multiple physical prototypes prior to launching a product by replacing expensive and time-consuming physical models with computer-generated models that help drive innovation.

CAE software from companies like Ansys can help accelerate product design and delivery, but only if you have the right hardware technology infrastructure in place to support their wide range of CAE applications and workloads. Outdated technologies struggle to keep up with the evolving needs of these applications, as they solve more complex problems with resource-consuming cutting-edge algorithms. Existing platforms, including legacy servers and workstations with limited capacity and scalability, can be a performance liability that leads to bottlenecks in getting new designs to market, resulting in underutilized technology and a loss of competitive advantage.

To solve this problem, companies are turning to an HPC infrastructure to provide the processing power necessary to meet their CAE requirements. The ability to leverage HPC has become indispensable in the design and creation of new products. Understanding the potential benefits of HPC begins with understanding how CAE software has changed the way products are developed.

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BEST PRACTICE 1

UNDERSTANDING THE LANDSCAPE OF CAE APPLICATIONS

CAE boosts collaboration throughout the supply chain, enabling engineering and design teams to rapidly communicate and speed up testing stages of development for new and existing products.

We live in a world where many physical forces are at play—fluid forces, thermal effects, structural integrity, electromagnetic radiation, and more—all of which can impact the performance of products and industrial processes. CAE applications are designed to model and simulate these real-world phenomena.

In a typical CAE scenario, engineers model the geometry and physical properties of a design as well as the environment, in the form of applied loads or constraints. A simulation is run by applying a mathematical representation of the underlying physics, and the results are analyzed to adapt or improve the design. The advantage of using computers for complex modeling and simulation is that, in the real world, the process being observed is often too slow, too fast, too big, too small, or too expensive to prototype or observe empirically. Imagine having to measure the relative velocity of an aircraft during production without technology to simulate the impact of airspeed, windspeed, ground speed, and other aerodynamic forces. These processes require tremendous compute power and detailed simulations. By accelerating insight, manufacturers can enable faster innovation and time to market CAE supports a broad scope of engineering disciplines:

- Structural analysis: stress analysis on components and assemblies
- Fluid analysis: thermal and fluid flows using computational fluid dynamics (CFD)
- Multibody dynamics (MBDs): kinematics analysis and calculation of loads
- Noise, vibration, and harshness (NVH)
- Multiphysics analysis: a combination of analytic techniques

The use of detailed CAE simulations enables manufacturers to accurately predict how products will behave in numerous operating scenarios. Initial designs can be tested through computer simulations, instead of in wind tunnels or fluid tanks, which can be costly and time-consuming processes. In this way, engineers can reserve valuable resources for designs that have the best potential for market success.

CAE solutions are employed in many areas of manufacturing, including:

- Automotive companies and their Tier 1 suppliers
- Aerospace and defense
- Consumer goods
- Energy
- Healthcare
- High-tech industrial equipment and rotating machinery
- Materials and chemical processing

BEST PRACTICE 2

IDENTIFYING CAE INFRASTRUCTURE CHALLENGES

Engineers have a need for speed and performance and require advanced simulation technology that reduces time to optimal product design.

From concept to reality, modeling and simulation provide an efficient, data-driven product development process. However, many companies that leverage CAE fail to realize the full benefits of these tools. The primary roadblock is compute performance. CAE simulation, design, and testing leverage vast amounts of data, which puts enormous stress on underlying IT infrastructure.

Traditionally, CAE software was deployed on desktop workstations. This approach is convenient for manufacturers running smaller or relatively simple simulations, but it also places constraints on the size and scope of workloads they can execute. Without high processing power, manufacturers have problems adapting to new trends in CAE software—like data-centric workflows and multiphysics simulations that would help them produce better designs faster.

Many engineers aren't sure how to address the speed and performance issues of their HPC environments, which create slow response times and increased time to value due to the power, memory, and storage limits of outdated hardware technologies. Manufacturers need an HPC infrastructure that can keep pace with their business needs.

As a market leader in HPC systems, Hewlett Packard Enterprise (HPE) enables comprehensive CAE solutions across compute, interconnect, system software, storage, and services—delivered on-premises, for hybrid, or as a service. What's more, HPE teams up with AMD to give you exceptional performance, flexibility, and choice in running a range of Ansys applications.

HPC clusters built with HPE servers and AMD® EPYC™ processors reduce TCO and maximize value from Ansys engineering simulation software licenses through key features:

- High-frequency processors enabling significant per-core performance
- High core count to complete jobs faster
- Large memory capacity, fast memory bandwidth, and high ratios of cache per core to further improve compute performance
- High I/O performance
- Low network latency and high network bandwidth to ensure better scaling
- Reliability, availability, and serviceability (RAS) to minimize downtime costs

Give your Ansys solvers the AMD edge.

AMD EPYC processors deliver world-class performance and scalability for CAE workloads:

- World's first 7 nm x86 server CPU
- Highest available core count to maximize parallelism
- World's first PCIe Gen4 capable x86 server CPU
- Eight memory channels per socket
- World's first x86 server processor with DDR4 3200 memory support
- Leadership L3 cache per core
- World record floating point performance

BEST PRACTICE 3

DEPLOYING ANSYS SOFTWARE

Ansys has revolutionized simulation technology with nearly unlimited computing capacity to reimagine product design and achieve product development goals that were previously thought impossible.

Ansys is a leading provider of CAE software, offering a rich solver and application portfolio to support the entire product development process. Ansys software contains sophisticated numeric modeling tools and robust solvers to deliver fast and accurate insights for nearly every engineering application. Coupled with an AMD processor-powered HPE cluster, the result is a high-value CAE solution that enables engineering and design teams to create virtual prototypes of products and systems rapidly.

Ansys simulations include mechanical, fluid, electronic, and embedded software components to test all possible physical conditions that exist in the real world to help reduce design cycle times, optimize development costs, and unleash a new breed of simulation technology.

Ansys provides not only a broad base of standard tools and services but industry-specific capabilities and expertise that deliver the flexibility and scalability engineers need for their distinctive industry. Ansys simulation software has also proven itself as a rapid and cost-effective means to overcome the unprecedented technological challenges involved in developing autonomous, electrified, and 5G systems. For example, it can significantly optimize and enhance the development of components such as antennas in autonomous vehicles, batteries in electric vehicles (EVs), and the semiconductors and infrastructure needed for 5G connectivity.

Applications like digital twins created using Ansys software help manufacturers model increasingly complex products and systems, employing physics-based models to analyze and diagnose how physical products will operate in real-time environments as well as make predictions about future performance and maintenance needs. Ansys digital twins optimize product development by virtually testing solutions and making physical repairs, reducing the risk of faulty design, and achieving better outcomes.

Based on more than three decades of HPC deployment and associated software development, Ansys recognizes the value and benefits HPC brings to its customers. Ansys HPC software licensing is designed on pricing models that ensure high value for engineering simulation workloads.

Various Ansys HPC licensing options allow you to scale to whatever level the computational simulation requires. Single users or small user groups can enable entry-level parallel processing up to virtually unlimited parallel capacity. For large user groups, Ansys facilitates multiple parallel processing simulations that are highly scalable for the most challenging projects. Apart from parallel computing, Ansys also offers special product solutions for parametric computing.

BEST PRACTICE 4

HARNESSING HIGH-VALUE CAE SOLUTIONS

HPE and AMD remove the constraints of legacy infrastructure by providing exceptional performance, flexibility, and choice on a range of CAE applications.

Harnessing the value of breakthrough simulation capabilities requires performance-optimized systems that are expertly engineered for your most demanding and data-intensive workloads. These platforms help manufacturers address the challenges of cost, competition, complexity, and customization in the product engineering space, so you can create high-quality products faster and more cost-effectively. High-performance CAE solutions provide much faster response times for simulations, support larger model sizes, and enable engineering collaboration across the organization. HPC users can realize faster time to market, improved productivity, and deeper insight into product designs. Tapping HPC fosters success in beating the competition, meeting the demands of increased regulation, and improves engineering productivity.

To realize these benefits, manufacturers invest in HPC platforms that are density-optimized to deliver maximum performance with greater simplicity and enhanced security. These groundbreaking technologies include resilient HPE Apollo servers powered by high-performance AMD EPYC processors. AMD adds an additional layer of security through AMD Secure Encrypted Virtualization and AMD Secure Memory Encryption, two breakthrough features of AMD EPYC processors, which allow manufacturers to help secure their data and memory, even while it is in use. HPE CAE solutions integrate compute, networking, software, storage, advisory services, and financial options that allow manufacturers to increase the scale of their HPC infrastructures quickly and easily. Now, compute capabilities that were once out of reach for manufacturers can be delivered either on-premises, in a hybrid environment, or as part of HPC as a service (HPCaaS).

CONCLUSION

HPE and AMD are enabling a new age of manufacturing with next-generation simulation technology. HPE Apollo 2000 Gen10 Plus systems powered by AMD EPYC processors with Ansys software are designed to enhance engineering productivity, to speed up time to market and maximize your ROI.

Let us help you achieve new levels of profit and performance in the next era of manufacturing.

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